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Mortality: Overview, 2012 and 2013

by André Lebel and Stacey Hallman

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[r] revised
x suppressed to meet the confidentiality requirements of the *Statistics Act*
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F too unreliable to be published
* significantly different from reference category ($p < 0.05$)

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MORTALITY: OVERVIEW, 2012 AND 2013

by André Lebel and Stacey Hallman[1]

Highlights

- The number of deaths recorded in Canada in a single year reached an unprecedented level in 2013: 252,338. This is 5,742 more than in 2012, when there were 246,596 deaths in Canada. Year-over-year increases in the number of deaths are expected because of the growth and aging of the population.
- At 7.2 deaths per 1,000 people, the crude mortality rate in 2013 was up slightly from the 2012 rate (7.1 deaths per 1,000 people).
- Standardized mortality rates show that the intensity of mortality gradually declined over a period of 30 years: the standardized rate for 1982 was 16.1 per 1,000, more than double what it was in 2013.

Key statistics

- There were 252,338 deaths in Canada in 2013.
  - There were 126,973 male deaths and 125,365 female deaths.
- The crude mortality rate was 7.2 deaths per 1,000 population.
- The infant mortality rate was 5.0 deaths per 1,000 live births.
- The life expectancy at birth was 81.7 years in 2011/2013.
  - The life expectancy at birth for men was 79.6 years.
  - The life expectancy at birth for women was 83.8 years.
- The life expectancy at age 65 is 20.5 years was 2011/2013.
  - The life expectancy at age 65 for men was 19.0 years.
  - The life expectancy at age 65 for women was 21.9 years.

- In 2013, the number of deaths in winter was 16% higher than the number of deaths during the summer.
- Only 1.0% of deaths among men and 0.9% of deaths among women occurred before age 10. On the other hand, 11.9% of deaths among men and 26.2% of deaths among women occurred at age 90 or older.
- Life expectancy at birth has improved significantly since the early 20th century; it peaked in the 2011/2013 period at 79.6 years for men and 83.8 years for women.
- Infant mortality has decreased sharply since 1921. A child born in 2013 was twenty times more likely to celebrate his or her first birthday than a child born in 1921 in Canada.

This article analyzes recent trends in deaths and mortality in Canada and in the provinces and territories, and puts these trends in a historical context. It is an update based on the most recent vital statistics data for the years 2012 and 2013. The revised data from Statistics Canada's population estimates for the same years were also used to compute various indicators from the 2010/2012 and 2011/2013 life tables. With this release, the CANSIM table (Table 053-0003) and Excel highlight tables associated with this publication have been updated; they now go back to the 1980/1982 period, using the same methodology.

The analysis focuses mainly on the total number of deaths, crude and standardized death rates, life expectancy at different ages, probabilities of dying, survival probabilities, infant mortality rates and monthly variations in deaths. Where relevant, the data are also analyzed by province and territory, as well as by age and sex.

1. The authors would like to thank Rufteen Shumanty, Éric Caron-Malenfant and Laurent Martel for their comments on a preliminary version of this article.

The number of deaths continues to increase

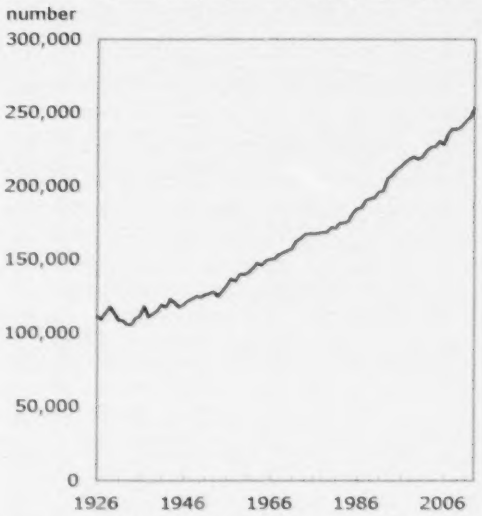
Since the mid-1930s, the number of deaths recorded each year in Canada has trended upward, despite some annual fluctuations (Figure 1).

After a slight decrease from 2008 (238,617 deaths) to 2009 (238,418 deaths), the number of deaths resumed its increase, reaching 252,338 in 2013. This is the highest level since the vital statistics registration system was introduced in the 1920s.

The increase in the number of deaths can be explained by two factors: population growth, i.e., a larger population generates a higher number of deaths; and population aging, i.e., the proportion of seniors (whose mortality is higher) is increasing. Other factors, such as particularly bad influenza outbreaks during colder winters, may explain some annual fluctuations.

The number of deaths is expected to keep increasing in coming years in Canada as the large cohort of baby boomers born between 1946 and 1965 gradually shifts to the older age groups.

Figure 1
Number of deaths, Canada, 1926 to 2013



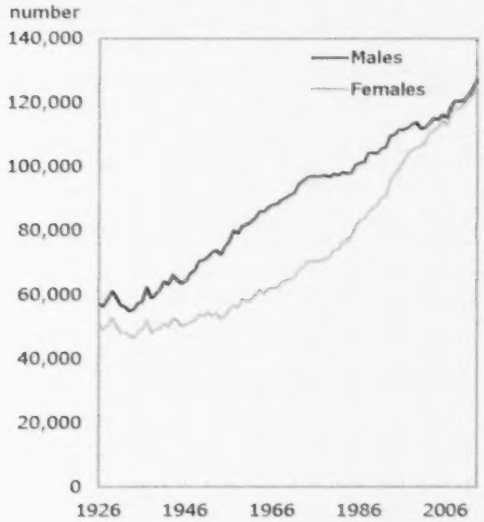
Source: Statistics Canada, Canadian Vital Statistics, Deaths Database, 1926 to 2013, Survey 3233.

Still slightly more male deaths than female

In 2013, there were slightly more male deaths (126,973) than female deaths (125,365) in Canada, the difference being 1,608 deaths (Figure 2).

The two numbers have been converging during the last three decades because female deaths have been increasing faster than male deaths. This situation is due to a more rapid decline in male mortality than in female mortality since the late 1970s, because women's lifestyles have become increasingly similar to men's. Thus, the increase in the number of deaths resulting from population growth and aging has been more moderate among males than among females.

Figure 2
Number of deaths by sex, Canada, 1926 to 2013

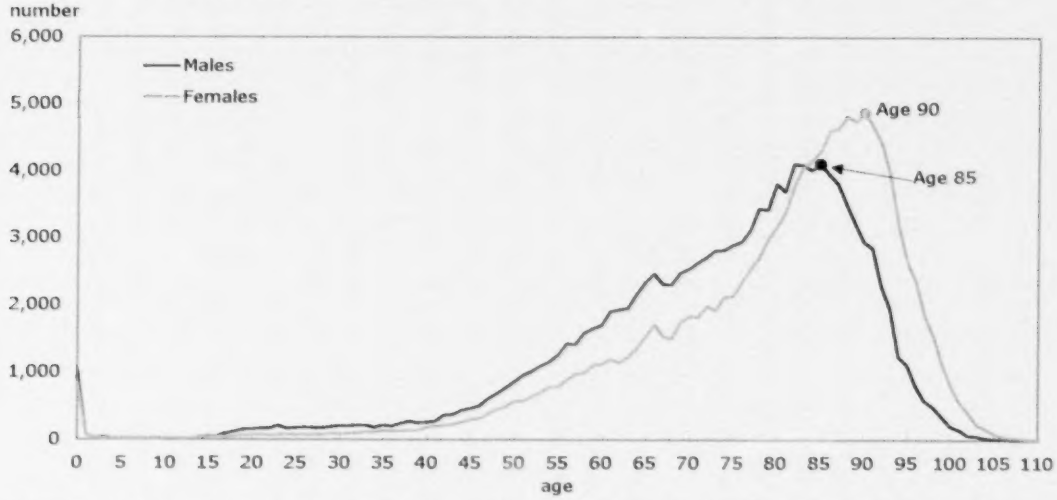


Source: Statistics Canada, Canadian Vital Statistics, Deaths Database, 1926 to 2013, Survey 3233.

In 2013, there were more male deaths than female deaths up to age 83, after which the situation reversed. Only a few ages below age 14 were exceptions to this pattern (Figure 3). At the oldest ages, there were fewer male survivors, owing to higher mortality risks for males than for females at every stage of life. Consequently, more deaths were observed among women than men at the oldest ages because more women reach this age group.

The highest number of deaths was recorded at age 85 for males (4,104) and age 90 for females (4,869) in 2013. For males, roughly three-quarters (74.5%) of all deaths occurred at age 65 or older, while for females, the proportion was 83.7%. Very few deaths were observed among people younger than 10: there were 1,289 male deaths (1.0% of all male deaths) and 1,076 female deaths (0.9% of all female deaths). Considerably more deaths were observed among people aged 90 and older, 32,837 deaths for females (26.2% of all female deaths) and 15,084 deaths for males (11.9% of all male deaths).

Figure 3
Number of deaths by age and sex, Canada, 2013

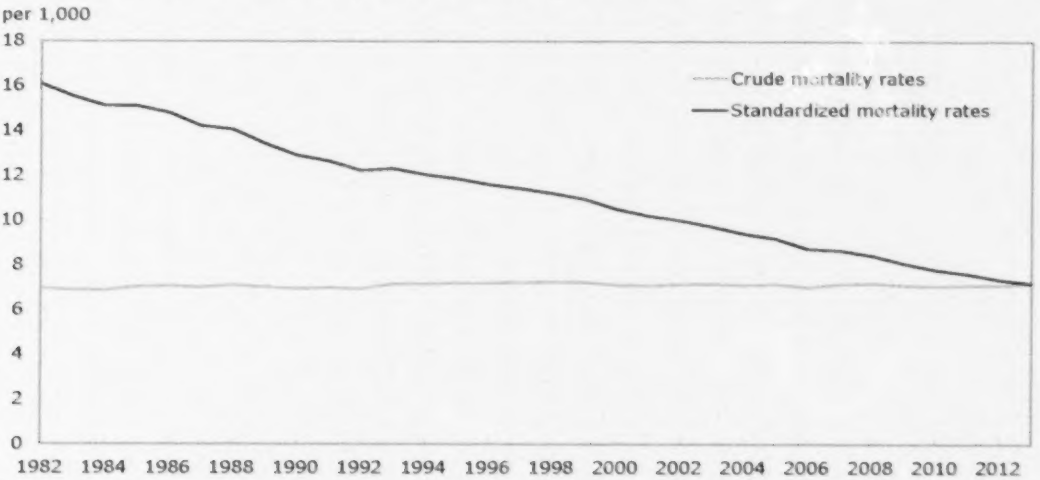


Note: Deaths for which the age of death is unknown were prorated using the observed distribution.
Source: Statistics Canada, Canadian Vital Statistics, Deaths Database, 2013, Survey 3233.

Mortality has decreased in recent decades

The number of deaths has been increasing in a context of declining mortality intensity. Since the early 1980s, the crude mortality rate has been on average 7.1 per 1,000. The aging population puts strong upward pressure on this rate. The resulting standardized mortality rates show that the intensity of mortality has gradually declined over the preceding 30 years. The standardized rate for 1982 was 16.1 per 1,000—a little more than double what it was in 2013 (7.2 per 1,000) (Figure 4).

Figure 4
Crude and standardized mortality rates, Canada, 1982 to 2013



Note: Deaths for which the age of death is unknown were prorated using the observed distribution.
Sources: Statistics Canada, Canadian Vital Statistics, Deaths Database, 1982 to 2013, Survey 3233 and Demography Division, Population Estimates Program (PEP).

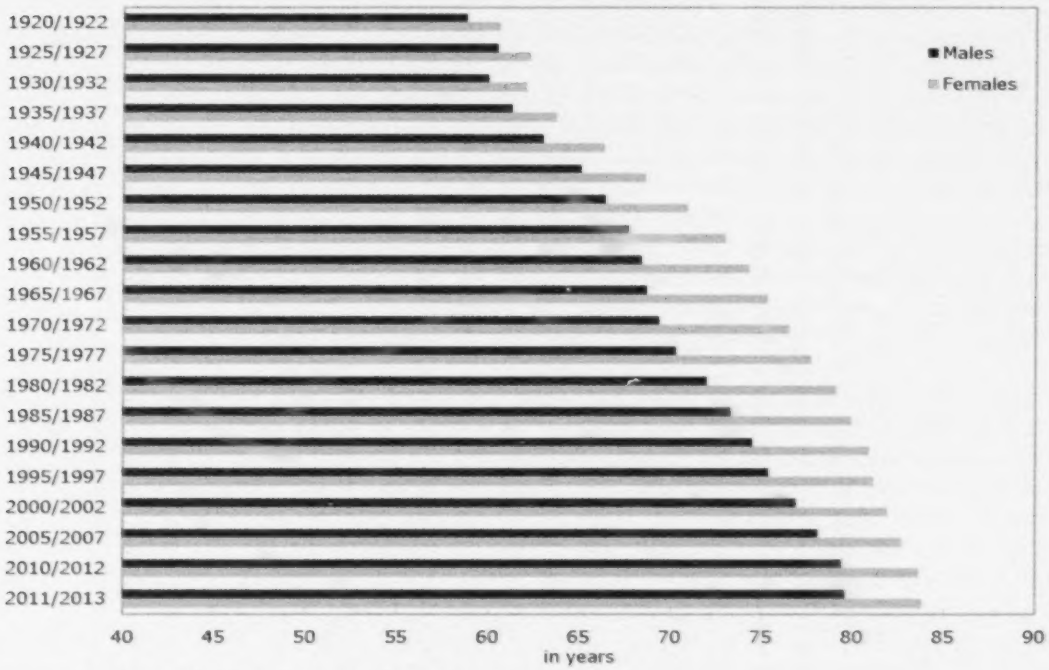
Strong increase in life expectancy in the 20th century

Although crude and standardized mortality rates provide insight into changes in mortality, experts often prefer period life expectancy, which consists of the average number of years individuals of a given population would live if, through the course of their lives, they experienced the age-specific probabilities of dying observed during a given calendar year or given period.

Period life expectancy must be distinguished from cohort life expectancy, which is the actual average number of years lived by a group of individuals born in a given year. Cohort life expectancy can be computed only once a given cohort is almost or totally extinct through mortality; therefore, it generally requires the use of demographic projections.

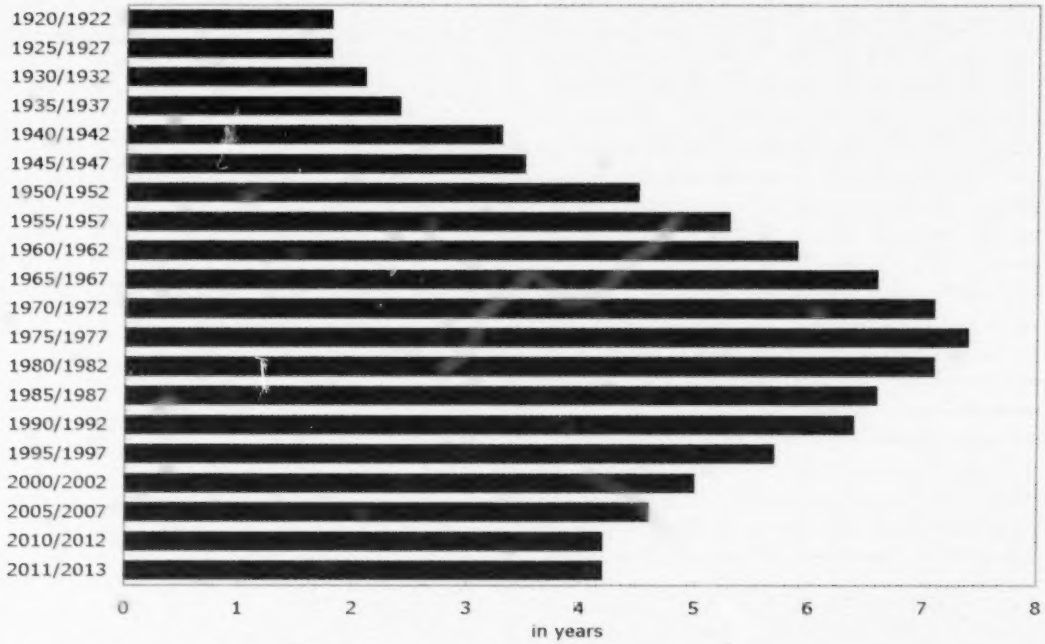
In Canada, life expectancy at birth has greatly improved since the early 20th century, reaching a peak in 2011/2013 (Figure 5). Since the early 1920s, the life expectancy of men at birth has increased by 20.8 years, from 58.8 years in the 1920/1922 period to 79.6 years in the 2011/2013 period. Over the same period, the life expectancy of women at birth grew slightly faster (by 23.2 years) from 60.6 years in the 1920/1922 period to 83.8 years in the 2011/2013 period. However, from the 1980/1982 period to the 2011/2013 period, the life expectancy gains were higher for men (7.6 years) than for women (4.7 years). The average male life expectancy in 1980/1982 was 72.0 years, and the average female life expectancy was 79.1 years.

Figure 5
Life expectancy at birth by sex, Canada, 1920/1922 to 2011/2013



Note: 1920/1922 excludes Quebec and Newfoundland and Labrador.
Sources: From 1920/1922 to 1975/1977: Nagnur, D. 1986. *Longevity and Historical Life Tables (Abridged), 1921-1981, Canada and Provinces*, catalogue no. 89-506. From 1980/1982 to 2011/2013: Statistics Canada. 2017. *Life tables, Canada, provinces and territories*, catalogue no. 84-537-X.

Figure 6
Gap (in years) in life expectancy at birth between females and males, Canada, 1920/1922 to 2011/2013



Note: 1920/1922 excludes Quebec and Newfoundland and Labrador.
Sources: From 1920/1922 to 1975/1977: Nagnur, D. 1986. *Longevity and Historical Life Tables: 1921-1981 (Abridged) Canada and the Provinces*, catalogue no. 89-506-X. From 1980/1982 to 2011/2013: Statistics Canada. 2017. *Life tables, Canada, provinces and territories*, catalogue no. 84-537-X.

Over the past 90 years, the gap in life expectancy between the sexes—a gap that favours women—has fluctuated between 1.8 years in both 1920/1922 and 1925/1927, and 7.4 years in 1975/1977 (Figure 6). The gap increased from the 1940/1942 to the 1975/1977 period, mainly because of higher male mortality from cardiovascular disease (primarily heart disease) and malignant neoplasms (mainly lung and other smoking-related cancers) (Waldron 1993 and Meslé 2004, cited in Bourbeau and Ouellet 2016).

Since 1975/1977, this gap has steadily decreased, reaching 4.2 years in 2011/2013. This catch-up by men appears to be primarily the result of a reduction in male–female mortality gaps associated with cardiovascular disease (Waldron 1993, Trovato and Lalu 1995, Pampel 2002, Meslé 2004, Trovato and Heyen 2006, and Trovato 2007, cited in Bourbeau and Ouellet 2016). Cardiovascular disease among women is often associated with their adoption of lifestyles similar to those of men—for example, as far as labour market participation, smoking levels and alcohol consumption are concerned.

Life expectancy at age 65 has also increased in recent decades in Canada. From the 1980/1982 period to the 2011/2013 period, it increased from 14.6 years to 19.0 years for men, and from 18.9 years to 21.9 years for women. The gap in favour of women at age 65 decreased from 4.3 years to 2.9 years over the same period. By way of comparison, in 1920/1922, the average number of years someone aged 65 could expect to live was 13.5 years for men and 16.1 years for women.

Nowadays, gains in life expectancy at birth occur mostly after age 65, whereas in the early 20th century, lower infant mortality (children younger than 1 year old) and juvenile mortality (children between 1 and 4 years old) accounted for the rapid increase in life expectancy (Bourbeau 2004, Bourbeau and Légaré 1997). Since the 1980/1982 period, declining mortality beyond age 65 has accounted for more than half the gains in life expectancy at birth for men (4.4 years of the 7.6 year gain) and women (3.0 years of the 4.7 year gain).

Life expectancy in Canada is among the highest in countries of the OECD

Based on life expectancies compiled for approximately 40 countries of the Organisation for Economic Co-operation and Development (OECD),[2] Canada ranked 13th among women (83.8 years) and 11th among men (79.6 years). Among women, Japanese women had the highest life expectancy at birth in 2013 (86.6 years), followed by Spanish women (86.1 years), French women (85.6 years) and Italian women (85.2 years). For men, the highest life expectancies at birth in 2013 were in Switzerland (80.7 years), Iceland (80.5 years), Italy (80.3 years), Israel (80.3 years) and Japan (80.2 years). The life expectancy at birth of Americans was 2.6 years lower for women (81.2 years) and 3.2 years lower for men (76.4 years) than the life expectancy at birth of Canadians. As a result, among OECD countries, the United States ranked 27th for men and 31st for women in 2013.

In terms of life expectancy at age 65, Canadian women ranked 10th among OECD countries (21.9 years), behind Japanese women (24.0 years) and French women (23.6 years). Canadian men ranked 12th (19.0 years), behind Swiss men (19.4 years) and French men (19.3 years) but well ahead of American men (17.9 years).

Increase in deaths and life expectancy in the provinces and territories

The upward trend in the number of deaths in recent decades was also observed in all provinces and territories (Table 1), despite some year-to-year fluctuations that usually had more of an effect in regions with a smaller population. Consistent with this trend, the number of recorded deaths in 2013 reached unprecedented levels in all provinces and territories, except Manitoba and the Northwest Territories.

Table 1

Number of deaths and crude death rate per 1,000 population, Canada, provinces and territories, 1981 to 2013

Year	N.L.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Y.T.	N.W.T.	Nvt.	Unknown	Canada
								number							
1981	3,230	992	6,958	5,139	42,684	62,838	8,648	7,523	12,823	19,857	141	196	..	0	171,029
1986	3,540	1,121	7,255	5,458	46,892	67,865	8,911	8,061	13,560	21,213	113	235	..	0	184,224
1991	3,798	1,188	7,255	5,469	49,121	72,917	8,943	8,098	14,451	23,977	114	237	..	1	195,569
1996	3,928	1,268	7,751	5,896	52,336	79,099	9,497	8,765	16,391	27,536	120	272	..	21	212,880
2001	4,151	1,160	7,879	6,062	54,194	81,214	9,734	8,740	17,579	28,353	134	163	123	52	219,538
2002	4,183	1,236	7,997	6,096	55,534	82,234	9,849	8,906	18,234	28,883	147	169	127	8	223,603
2003	4,281	1,183	8,064	6,257	54,927	84,207	9,867	9,007	18,585	29,320	133	202	134	2	226,169
2004	4,308	1,223	8,241	6,247	55,624	83,142	9,903	8,844	18,675	29,923	166	153	121	14	226,584
2005	4,486	1,118	8,273	6,175	55,787	85,591	9,856	8,850	19,288	30,227	164	148	115	54	230,132
2006	4,493	1,172	8,088	6,010	54,240	84,524	9,774	9,054	19,540	30,688	178	182	129	7	228,079
2007	4,505	1,147	8,353	6,324	56,521	87,340	9,958	9,062	20,202	31,308	192	174	129	2	235,217
2008	4,539	1,201	8,220	6,450	57,106	88,041	10,073	9,243	21,079	32,095	198	201	147	24	238,617
2009	4,391	1,268	8,227	6,366	57,769	88,468	9,972	8,972	20,987	31,440	201	186	162	9	238,418
2010	4,481	1,116	8,295	6,312	58,806	89,282	9,985	9,205	20,755	31,324	198	184	132	0	240,075
2011	4,527	1,253	8,533	6,411	59,539	89,976	10,250	9,262	21,242	31,966	193	188	171	0	243,511
2012	4,635	1,231	8,415	6,443	60,774	90,740	10,062	9,204	22,001	32,524	206	200	161	0	246,596
2013	4,837	1,284	8,878	6,627	61,289	93,343	10,095	9,333	22,844	33,200	215	199	194	0	252,338
								rate per 1,000							
1981	5.6	8.0	8.1	7.3	6.5	7.1	8.4	7.7	5.6	7.0	5.9	4.1	..	...	6.9
1986	6.1	8.7	8.2	7.5	7.0	7.2	8.2	7.8	5.6	7.1	4.6	4.3	..	...	7.1
1991	6.6	9.1	7.9	7.3	7.0	7.0	8.1	8.1	5.6	7.1	3.9	6.1	..	...	7.0
1996	7.0	9.3	8.3	7.8	7.2	7.1	8.4	8.6	5.9	7.1	3.8	6.5	..	...	7.2
2001	8.0	8.5	8.5	8.1	7.3	6.8	8.5	8.7	5.8	7.0	4.4	4.0	4.4	...	7.1
2002	8.1	9.0	8.6	8.1	7.5	6.8	8.5	8.9	5.8	7.0	4.8	4.1	4.4	...	7.1
2003	8.3	8.6	8.6	8.3	7.3	6.9	8.5	9.0	5.8	7.1	4.3	4.7	4.6	...	7.1
2004	8.3	8.9	8.8	8.3	7.4	6.7	8.4	8.9	5.8	7.2	5.3	3.5	4.1	...	7.1
2005	8.7	8.1	8.8	8.3	7.4	6.8	8.4	8.9	5.8	7.2	5.1	3.4	3.8	...	7.1
2006	8.8	8.5	8.6	8.1	7.1	6.7	8.3	9.1	5.7	7.2	5.5	4.2	4.2	...	7.0
2007	8.9	8.3	8.9	8.5	7.3	6.8	8.4	9.0	5.7	7.3	5.9	4.0	4.1	...	7.2
2008	8.9	8.7	8.8	8.6	7.4	6.8	8.4	9.1	5.9	7.4	6.0	4.6	4.6	...	7.2
2009	8.5	9.1	8.8	8.5	7.4	6.8	8.3	8.7	5.7	7.1	6.0	4.3	5.0	...	7.1
2010	8.6	7.9	8.8	8.4	7.4	6.8	8.2	8.8	5.6	7.0	5.7	4.3	4.0	...	7.1
2011	8.6	8.7	9.0	8.5	7.4	6.8	8.3	8.7	5.6	7.1	5.5	4.3	5.0	...	7.1
2012	8.8	8.5	8.9	8.5	7.5	6.8	8.0	8.5	5.7	7.2	5.7	4.6	4.6	...	7.1
2013	9.2	8.8	9.4	8.8	7.5	6.9	8.0	8.4	5.7	7.2	5.9	4.5	5.5	...	7.2

Notes: Deaths for which the province is unknown were prorated using the observed distribution to calculate the rates. Nunavut is included in the Northwest Territories before 2001.

Sources: Statistics Canada, Canadian Vital Statistics, Deaths Database, 1981 to 2013, Survey 3233 and Demography Division, Population Estimates Program (PEP).

2. OECD. 2017. *Life expectancy at birth (indicator)*. doi:10.1787/27e0fc9d-en (accessed May 19, 2017).

Table 2
Life expectancy at birth and at age 65, Canada, provinces and territories, 2011/2013

Region	At birth		At age 65	
	Males	Females	Males	Females
	in years			
Canada	79.6	83.8	19.0	21.9
Newfoundland and Labrador	77.4	81.6	17.3	20.2
Prince Edward Island	78.4	83.1	17.9	21.2
Nova Scotia	78.1	82.5	17.8	20.9
New Brunswick	78.5	83.1	18.4	21.3
Quebec	79.7	83.8	18.8	21.8
Ontario	80.1	84.2	19.2	22.1
Manitoba	77.8	82.3	18.2	21.3
Saskatchewan	77.7	82.3	18.4	21.4
Alberta	79.2	83.6	18.9	21.9
British Columbia	80.4	84.4	19.6	22.3
Yukon	76.3	81.2	16.8	20.8
Northwest Territories	75.6	80.1	16.4	20.3
Nunavut	68.4	72.9	14.5	14.8

Source: Statistics Canada. 2017. *Life tables, Canada, provinces and territories*, catalogue no. 84-537-X.

British Columbia continued to have the highest life expectancy at birth in the country. This is true for both men (80.4 years) and women (84.4 years) in the most recent period (2011/2013) (Table 2).

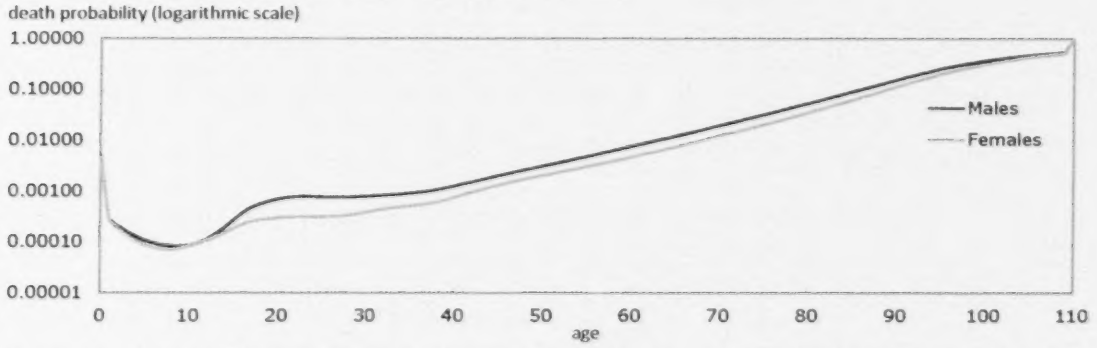
The lowest life expectancy at birth was still in Nunavut, where men could expect to live 68.4 years and women 72.9 years, according to 2011/2013 mortality. The difference in life expectancy at birth between these two jurisdictions was 12.0 years for men and 11.5 years for women.

Ontario and Quebec were the only other provinces with life expectancies at birth close to or above the national average in recent years. All the other provinces and all the territories had life expectancies at birth that were below the national average.

Mortality gaps between men and women are decreasing

Over a lifespan, the death probabilities, representing the probability of dying at each age for an individual, follow a pattern similar to a checkmark shape: the death probability is higher in the first year of life—most often in the first few days—and then decreases to the lowest level between ages 1 and 14 (Figure 7). The probability then climbs higher between approximately 15 and 24 years of age (especially among males) because of violent deaths such as accidents and suicides. After that, the probability increases steadily, reaching a peak of roughly 0.4 (i.e., two in five chances of dying in a given year) at age 105 and older.

Figure 7
Death probabilities by age and sex, Canada, 2011/2013



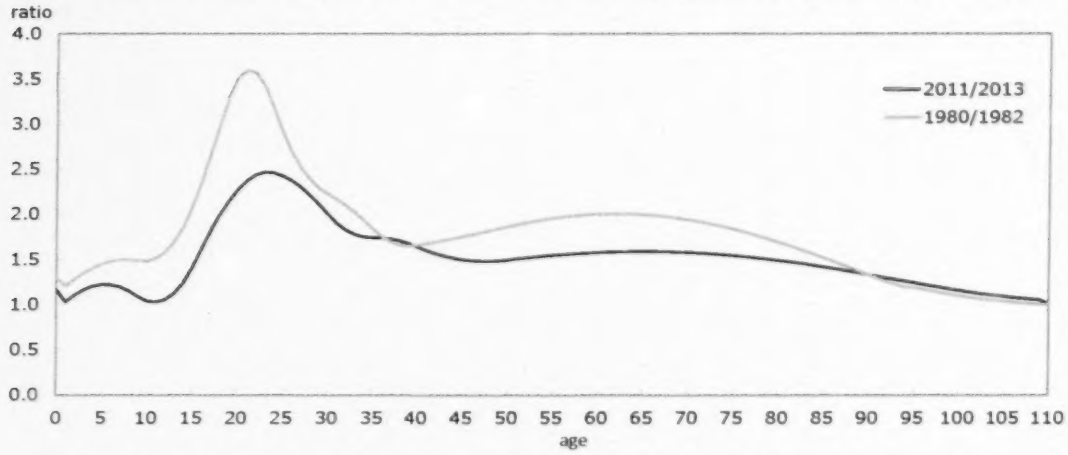
Notes: Deaths for which the age of death is unknown were prorated using the observed distribution. The death probability at age 110 is equal to 1 and represents the probability for the open age group of 110 and over.
Source: Statistics Canada. 2017. *Life tables, Canada, provinces and territories*, catalogue no. 84-537-X.

Probabilities of dying in 2011/2013 were consistently lower for females than for males throughout their lifespan: the age-specific ratios of male to female probabilities were always above 1 (Figure 8). The biggest gap was observed among people in their early 20s; it decreased from the 1980/1982 period to the 2011/2013 period. The smallest gap was observed at the oldest ages, possibly because of a selection effect: survivors at these ages may be more "resilient," thereby accounting for a lower male-to-female ratio (Coale and Kisker 1990).

Over the last 30 years, mortality differences between males and females have decreased, especially for people in their 20s and between 50 and 75 years of age. For example, the probability of dying for males in their early 20s was 3.6 times higher than that of females in 1980/1982, compared with 2.5 times higher in 2011/2013. Many factors account for this trend. The three most significant are a reduction in violent deaths among male teenagers and young adults; better treatments for cardiovascular disease; and an increasing similarity between the behaviour of women and men, particularly as regards smoking, alcohol consumption and work-related stress.

Figure 8

Ratio of probabilities of dying between females and males by age, Canada, 1980/1982 and 2011/2013



Notes: Deaths for which the age of death is unknown were prorated using the observed distribution. The probability of dying at age 110 is equal to 1 and represents the probability for the open age group of 110 and over.

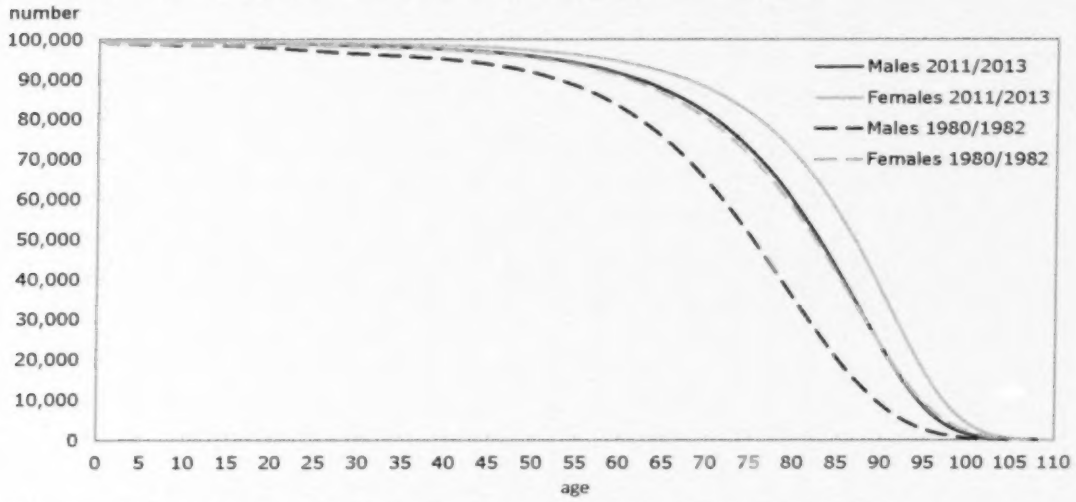
Source: Statistics Canada. 2017. *Life tables, Canada, provinces and territories*, catalogue no. 84-537-X.

More and more people are surviving to advanced ages

Survival probabilities between any two ages can be computed with data on the number of survivors, available in Statistics Canada's complete life tables.

As seen in Figure 9, more and more people are surviving to advanced ages. Over the last 30 years, the survival curves in the life tables have taken an increasingly rectangular shape. Although men have not caught up with women in terms of survival, they experienced more progress during this period. For example, the 2011/2013 period life table shows that 87% of male newborns and 92% of female newborns would survive to age 65 if, throughout their lives, they experienced the age-specific probabilities of dying observed during this period. In 1980/1982, these proportions were only 75% among males and 86% among females, which means that there has been a 12 percentage point increase for males and a 6 percentage point increase for females.

Figure 9
Survival probabilities by age and sex, Canada, 1980/1982 and 2011/2013



Note: Deaths for which the age of death is unknown were prorated using the observed distribution.
Source: Statistics Canada. 2017. *Life tables, Canada, provinces and territories*, catalogue no. 84-537-X.

Interestingly, the probabilities of survival, by age, of women in 1980/1982, are similar to those of men in 2011/2013, illustrating the extent of the gap in mortality between the sexes.

The probability of surviving between ages 65 and 85 was 48% among males and 62% among females in 2011/2013—much higher than in 1980/1982, when it was 27% for males and 48% for females.

The mortality patterns observed during the 2011/2013 period indicate that the chances of a newborn reaching 100 years of age was 1.4% for males and 4.1% for females. In 1980/1982, 31 years earlier, both males and females had roughly half the chance of surviving to age 100—0.5% for males and 2.1% for females.

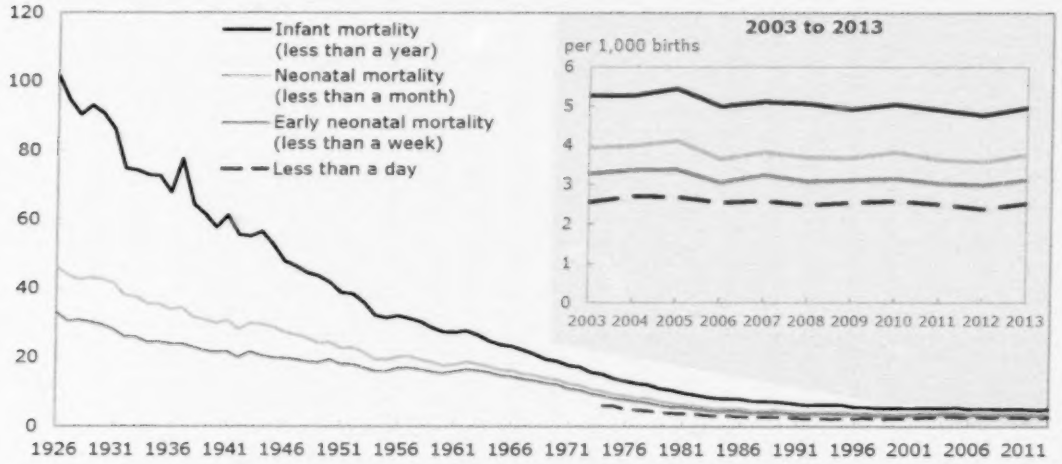
Infant mortality has fallen sharply since the 1920s

Infant mortality—that is, the mortality rate for children under 1 year of age—has decreased sharply since 1921. For example, a child born in 2013 was 20 times more likely to celebrate his or her first birthday than a child born in 1921 in Canada (Figure 10). In 1921, infant mortality was 102.2 per 1,000 live births, meaning that 1 in 10 children did not reach 1 year of age. The infant mortality rate in 2013 was much lower, at 5.0 deaths per 1,000 live births, but similar to the average for the 10 preceding years. Deaths during the first year of life totalled 1,884 in 2013, up from 2012 (1,818 deaths).

The infant mortality rate can vary considerably from one province or territory to another (Table 3). In 2013, the highest rate was in Nunavut, at 16.4 deaths per 1,000 live births, and the lowest was in Prince Edward Island, at 2.1 deaths per 1,000 live births. In recent years, only British Columbia has had an infant mortality rate consistently below 4.0 deaths per 1,000 live births. Infant mortality in this province was 3.7 deaths per 1,000 births in 2013.

Figure 10

Infant, neonatal, early neonatal and less than a day mortality rates, Canada, 1926 to 2013



Notes: Deaths for which the age of death is unknown were prorated using the observed distribution. Infant mortality refers to deaths of infants aged 0 to 364 days. Neonatal mortality refers to deaths of infants aged 0 to 27 days. Early neonatal mortality refers to deaths of infants aged 0 to 6 days. Less than a day refers to deaths of infants aged less than 24 hours.

Source: Statistics Canada, Canadian Vital Statistics, Deaths Database, 1926 to 2013, Survey 3233.

Infant mortality can be broken down into three categories: early neonatal mortality (death in the 1st week of life), neonatal mortality (death in the 1st month of life) and post-neonatal mortality (death between the 1st and 12th month of life). In 2013, in Canada, nearly two-thirds (63%) of deaths occurring in the first year of life actually occurred in the first week of life, with an additional 13% occurring in the remainder of the first month of life. Thus, roughly three in four deaths (76%) occurred before the beginning of the second month of life. The remaining infant deaths (24%) occurred after the first month of life but before either the first birthday or the end of the calendar year. In comparison, 50 years earlier (in 1963), the corresponding proportions were 61% for the first week of life and 8% for the remainder of the first month of life. In addition, roughly half (50.7%) of the 1,884 infants who died in Canada in 2013 died within 24 hours of birth.

Since 1926, the decline in the infant mortality rate has mainly been to the result of the decline in infant mortality after the first month of life. Deaths occurring in the first month (neonatal mortality) are usually caused by congenital malformations or by problems during birth (endogenous mortality). Deaths occurring between the ages of 1 month and 1 year are more often attributable to external events such as illnesses or accidents (exogenous mortality) (Bourgeois-Pichat 1951), which are generally avoidable causes of death and are more likely to be influenced by advances in medical technology.

Table 3

Number and rate of infant mortality, Canada, provinces and territories, 1981 to 2013

Year	N.L.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Y.T.	N.W.T.	Nvt.	Unknown	Canada
								number							
1981	98	25	139	114	807	1,073	191	203	452	424	8	28	..	0	3,562
1986	65	13	104	81	604	969	157	157	393	355	12	28	..	0	2,938
1991	56	13	69	58	578	953	111	126	285	298	6	20	..	0	2,573
1996	38	8	59	40	396	802	104	112	236	237	0	19	..	0	2,051
2001	23	10	50	31	349	713	98	68	210	168	3	3	12	1	1,739
2002	21	2	36	27	346	681	98	67	283	183	3	7	8	0	1,762
2003	23	7	49	29	322	692	111	76	265	170	2	4	15	0	1,765
2004	23	6	40	30	342	735	97	74	236	175	4	0	12	1	1,775
2005	28	3	34	28	353	745	94	99	286	183	0	3	7	0	1,863
2006	24	3	34	28	415	674	88	75	238	171	3	7	10	1	1,771
2007	34	7	29	31	379	723	111	77	296	176	3	3	12	0	1,881
2008	25	3	32	24	379	753	101	85	317	166	2	7	13	4	1,911
2009	31	5	31	43	389	705	100	96	284	161	3	11	13	0	1,872
2010	26	5	41	25	440	695	106	84	299	166	2	1	12	0	1,902
2011	28	6	43	25	399	664	120	97	267	171	0	5	24	0	1,849
2012	25	5	40	40	441	684	92	80	223	166	1	3	18	0	1,818
2013	29	3	29	33	438	681	93	111	285	161	1	5	15	0	1,884
								rate per 1,000							
1981	10.8	13.2	11.5	10.9	8.5	8.8	11.9	11.8	10.6	10.2	14.9	21.5	..	...	9.6
1986	8.5	6.7	8.4	8.3	7.1	7.2	9.2	9.0	9.0	8.5	24.8	18.6	..	...	7.9
1991	7.8	6.9	5.7	6.1	5.9	6.3	6.4	8.2	6.7	6.5	10.6	12.2	..	...	6.4
1996	6.6	4.7	5.6	4.9	4.6	5.7	6.7	8.4	6.2	5.1	0.0	12.2	..	...	5.6
2001	4.9	7.3	5.6	4.3	4.7	5.4	7.0	5.5	5.6	4.1	8.7	4.9	16.9	...	5.2
2002	4.5	1.5	4.2	3.8	4.8	5.3	7.1	5.7	7.3	4.6	8.8	11.0	11.0	...	5.4
2003	5.0	4.9	5.7	4.1	4.4	5.3	8.0	6.3	6.6	4.2	6.0	5.7	19.8	...	5.3
2004	5.1	4.3	4.6	4.3	4.6	5.5	7.0	6.2	5.8	4.3	11.0	0.0	16.1	...	5.3
2005	6.2	2.2	4.0	4.1	4.6	5.6	6.6	8.3	6.8	4.5	0.0	4.2	10.0	...	5.4
2006	5.3	2.1	4.0	4.0	5.1	5.0	6.0	6.1	5.3	4.1	8.2	10.2	13.4	...	5.0
2007	7.5	5.0	3.3	4.3	4.5	5.2	7.3	5.8	6.0	4.0	8.5	4.1	15.1	...	5.1
2008	5.1	2.0	3.5	3.2	4.3	5.4	6.5	6.2	6.2	3.8	5.4	9.7	16.2	...	5.1
2009	6.3	3.4	3.4	5.8	4.4	5.0	6.3	6.7	5.5	3.6	7.8	15.5	14.8	...	4.9
2010	5.3	3.6	4.6	3.4	5.0	5.0	6.7	5.9	5.9	3.8	5.2	1.4	14.5	...	5.0
2011	6.3	4.2	4.9	3.5	4.5	4.7	7.7	6.8	5.2	3.9	0.0	7.2	28.7	...	4.9
2012	5.7	3.8	4.6	5.7	5.0	4.8	5.6	5.4	4.2	3.8	2.3	4.4	21.4	...	4.8
2013	6.4	2.1	3.4	4.7	4.9	4.9	5.6	7.5	5.3	3.7	2.5	7.5	16.4	...	5.0

Notes: Deaths for which the province is unknown were prorated using the observed distribution to calculate the rates. Nunavut is included in the Northwest Territories before 2001.

Sources: Statistics Canada, Canadian Vital Statistics, Deaths Database, 1981 to 2013, Survey 3233.

Winter deaths were 16% more numerous than summer deaths in 2013

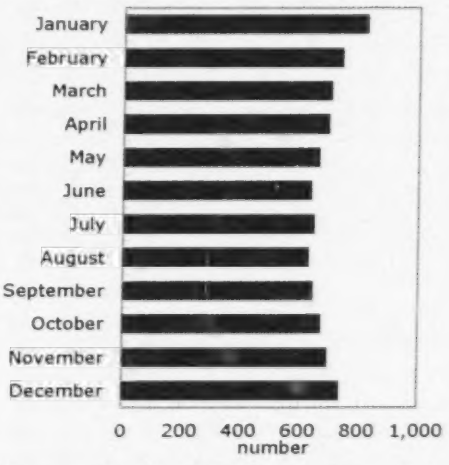
In 2013, there were, on average, 21,028 deaths in Canada per month and 691 deaths per day (Figure 11). The highest daily average was in January, with 826 deaths per day.

The second-highest daily average was in February, at 740 deaths.[3] November, December, January, February, March and April each had an average daily number of deaths higher than the average. The lowest daily average numbers of deaths were in June (639 deaths per day) and August (631 deaths per day).

A winter/summer ratio, as proposed by Rau (2017), in which the total number of winter deaths (January to March) is divided by the total number of summer deaths (July to September), provides an indication of the seasonal increase in winter deaths (Figure 12). A value of 1 indicates no seasonal difference in total deaths. The ratio for Canada in 2013 was 1.16, meaning that deaths in winter were 16% more numerous than they were in the summer. From 1974 to 2013, the winter/summer ratio for all deaths in Canada averaged 1.11, ranging from a high of 1.24 in 1998 to a low of 1.02 in 1979.

Figure 11

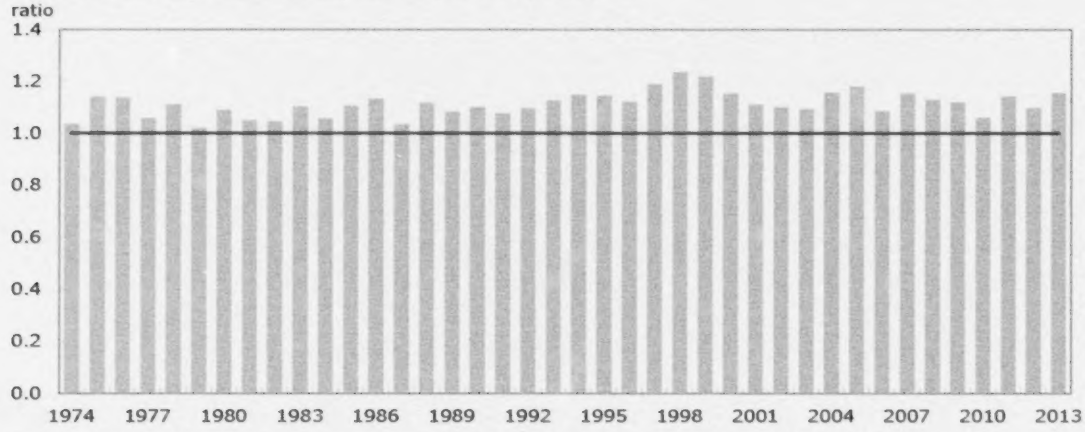
Average daily number of deaths, by month, Canada, 2013



Source: Statistics Canada, Canadian Vital Statistics, Deaths Database, 2013, Survey 3233.

3. The average daily number of deaths each month account for the different number of days per month, including leap years.

Figure 12
Winter to summer death ratio, Canada, 1974 to 2013

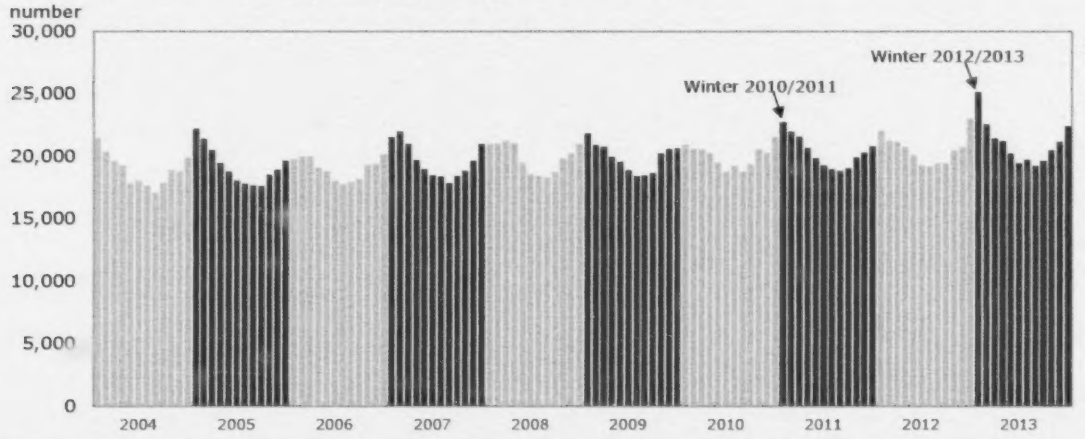


Source: Statistics Canada, Canadian Vital Statistics, Deaths Database, 1974 to 2013, Survey 3233.

According to Rau (2007), the three main causes of death responsible for the increased mortality during the winter are "cardiovascular, cerebrovascular, and respiratory diseases. The latter group has the strongest seasonal pattern among all major groups of causes of death." Cold temperatures have a physiological impact on the human body, and cold temperatures combined with low relative humidity create an ideal environment for influenza virus transmission (Lowen et al. 2007). Furthermore, winter brings about behavioural changes that exacerbate respiratory ailments. People are more likely to congregate in heated houses, which increases the risk of droplet transmission of infectious agents.

Figure 13 shows the average monthly number of deaths in Canada from January 2004 to December 2013. Each year, there is a large number of deaths in the winter months. In the last 10 years, this fluctuation was particularly significant in the winter of 2012/2013, but is also noticeable in the winter of 2010/2011. By way of explanation, an analysis of the variation in the 10 leading causes of death reveals that the increase in the number of deaths from 2012 to 2013 was linked mainly to mortality from influenza and pneumonia (15.1%) (Statistics Canada 2013). Among the other leading causes, deaths from chronic lower respiratory diseases showed the second-largest increase from 2012 to 2013, at 7.6%.

Figure 13
Average number of deaths by month, Canada, 2004 to 2013



Source: Statistics Canada, Canadian Vital Statistics, Deaths Database, 2004 to 2013, Survey 3233.

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